

APPLICATION

FOR UNITED STATES LETTERS PATENT

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT I, **Duane Ley**, a citizen of the United States, have
invented a new and useful mortise and tenon joint system of which the following is a
specification:

1
2
3 **Mortise and Tenon Joint System**
4
5

6 **CROSS REFERENCE TO RELATED APPLICATIONS**

7 I hereby claim benefit under Title 35, United States Code, Section 120 of
8 United States patent application Serial Number 10/104,189 filed March 22, 2002. This
9 application is a continuation of the 10/104,189 application. The 10/104,189
10 application is currently pending. The 10/104,189 application is hereby incorporated by
11 reference into this application.
12
13
14

15 **STATEMENT REGARDING FEDERALLY**
16 **SPONSORED RESEARCH OR DEVELOPMENT**

17 Not applicable to this application.
18
19

20 **BACKGROUND OF THE INVENTION**
21
22
23

24 **Field of the Invention**
25

26 The present invention relates generally to miter joints and more specifically it
27 relates to a mortise and tenon joint system for providing miter joints with increased
28 strength and resistance to expansion.
29

Description of the Prior Art

Miter joints have been in use for years by wood working professionals. Conventional miter joints are typically utilize dowels, splines, plate-jointer biscuits, or mortise and tenons for increasing the overall strength of the miter joint. The mortise is usually a rectangular cavity formed within an end of a piece of material for receiving a tenon. The tenon usually has a structure similar in shape to the mortise. The tenon and the mortise typically have relatively smooth outer and inner walls respectively that are positionable adjacent to one another. An adhesive is typically applied to the mortise and/or tenon with a brush or similar device prior to assembly for securing the tenon within the mortise. The tenon is then positioned within the mortise and the adhesive is allowed to dry thereby securing the tenon within the mortise. Another method of applying adhesive to a mortise and tenon joint is comprised of hydraulically inputting the adhesive between the outer wall of the tenon and the inner wall of the mortise if sufficient clearance exists.

The main problem with conventional mortise and tenon joints is that the adhesive is not completely nor evenly distributed throughout the joint because of the inherent problems of using a hand brushed adhesive. Another problem with conventional mortise and tenon joints is that the usage of a hydraulic distribution of the adhesive within the joints sometimes do not have sufficient clearance thereby possibly causing a "blowout" in the joint resulting in physical damage to the wood. A further problem with conventional mortise and tenon joints is that when hydraulic distribution is utilized, increased clearance is required thereby making it difficult to center the tenon within the mortise. A further problem with conventional mortise and tenon joints is that it is difficult to utilize higher viscosity adhesives which have a higher bond strength, such as polyurethane reactive (PUR). Another problem with conventional mortise and tenon joints is that the lower viscosity adhesives utilized

1 sometimes are undesirably dispersed from the joint onto the outer surface of the wood
2 thereby damaging the appearance of the work piece. Another problem with
3 conventional mortise and tenon joints is that they are labor intensive and not efficient
4 to construct.

5
6 While these devices may be suitable for the particular purpose to which they
7 address, they are not as suitable for providing miter joints with increased strength and
8 resistance to expansion. Conventional mortise and tenon joint systems do not provide
9 the desired strength and ease of usage to secure a miter joint.

10
11 In these respects, the mortise and tenon joint system according to the present
12 invention substantially departs from the conventional concepts and designs of the prior
13 art, and in so doing provides an apparatus primarily developed for the purpose of
14 providing miter joints with increased strength and resistance to expansion.

1

2 **SUMMARY OF THE INVENTION**

3

4 In view of the foregoing disadvantages inherent in the known types of miter
5 joints now present in the prior art, the present invention provides a new mortise and
6 tenon joint system construction wherein the same can be utilized for providing miter
7 joints with increased strength and resistance to expansion.

8

9 The general purpose of the present invention, which will be described
10 subsequently in greater detail, is to provide a new mortise and tenon joint system that
11 has many of the advantages of the miter joint systems mentioned heretofore and many
12 novel features that result in a new mortise and tenon joint system which is not
13 anticipated, rendered obvious, suggested, or even implied by any of the prior art miter
14 joints, either alone or in any combination thereof.

15

16 To attain this, the present invention generally comprises a board member
17 having a first end and a second end, a tenon extending from the first end of the board
18 member, a plurality of channels extending transversely into an outer sidewall of the
19 tenon, and a mortise extending into the second end of the board member having a form
20 similar to the tenon. The tenon includes a base channel, a first channel, a second
21 channel and an end channel. The channels are preferably parallel to one another and
22 preferably completely surround the tenon in a connected manner. The distance
23 between the base channel and the first channel is preferably greater than the distance
24 between the first channel and the second channel.

25

26 There has thus been outlined, rather broadly, the more important features of the
27 invention in order that the detailed description thereof may be better understood, and
28 in order that the present contribution to the art may be better appreciated. There are
29 additional features of the invention that will be described hereinafter and that will form

1 the subject matter of the claims appended hereto.

2
3 In this respect, before explaining at least one embodiment of the invention in
4 detail, it is to be understood that the invention is not limited in its application to the
5 details of construction and to the arrangements of the components set forth in the
6 following description or illustrated in the drawings. The invention is capable of other
7 embodiments and of being practiced and carried out in various ways. Also, it is to be
8 understood that the phraseology and terminology employed herein are for the purpose
9 of the description and should not be regarded as limiting.

10
11 A primary object of the present invention is to provide a mortise and tenon joint
12 system that will overcome the shortcomings of the prior art devices.

13
14 A second object is to provide a mortise and tenon joint system for providing
15 miter joints with increased strength and resistance to expansion.

16
17 Another object is to provide a mortise and tenon joint system that reduces the
18 likelihood of adhesive escaping the joint.

19
20 An additional object is to provide a mortise and tenon joint system that allows
21 for the usage of higher viscosity adhesives.

22
23 A further object is to provide a mortise and tenon joint system that allow for a
24 snug fit between the mortise and the tenon.

25
26 Another object is to provide a mortise and tenon joint system that has a reduced
27 tendency to form gaps.

1 A further object is to provide a mortise and tenon joint system that can be
2 efficiently assembled.

3
4 Another object is to provide a mortise and tenon joint system that allows for
5 even distribution of adhesive throughout the joint regardless of the method of applying
6 the adhesive.

7
8 Other objects and advantages of the present invention will become obvious to the
9 reader and it is intended that these objects and advantages are within the scope of the
10 present invention.

11
12 To the accomplishment of the above and related objects, this invention may be
13 embodied in the form illustrated in the accompanying drawings, attention being called
14 to the fact, however, that the drawings are illustrative only, and that changes may be
15 made in the specific construction illustrated and described within the scope of the
16 appended claims.

1
2 **BRIEF DESCRIPTION OF THE DRAWINGS**
3

4 Various other objects, features and attendant advantages of the present
5 invention will become fully appreciated as the same becomes better understood when
6 considered in conjunction with the accompanying drawings, in which like reference
7 characters designate the same or similar parts throughout the several views, and
8 wherein:

9
10 FIG. 1 is a side view of the present invention illustrating the tenon structure.
11

12 FIG. 2 is a top view of the present invention.
13

14 FIG. 3 is an upper perspective view of the present invention illustrating the
15 tenon.
16

17 FIG. 4 is an upper perspective view of the present invention illustrating the
18 mortise.
19

20 FIG. 5 is an exploded upper perspective view of a plurality of board members
21 with respect to one another prior to assembly.
22

23 FIG. 6 is a front view of the plurality of board members of Figure 5 secured
24 together with the tenon and mortise joint.
25

26 FIG. 7 is a cutaway view of the tenon positioned within the mortise.
27

28 FIG. 8 is a cross sectional view taken along line 8-8 with adhesive applied
29 within the joint.

1

2 FIG. 9 is a cross sectional view taken along line 9-9 of Figure 1 illustrating the
3 mortise structure.

4

5 FIG. 10 is a cross sectional view taken along line 10-10 of Figure 1 illustrating
6 the tenon structure.

7

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, FIGS. 1 through 10 illustrate a mortise and tenon joint system 10, which comprises a board member 20 having a first end 22 and a second end 24, a tenon 40 extending from the first end 22 of the board member 20, a plurality of channels 42, 44, 46, 48 extending transversely into an outer sidewall of the tenon 40, and a mortise 30 extending into the second end 24 of the board member 20 having a form similar to the tenon 40. The tenon 40 includes a base channel 42, a first channel 44, a second channel 44 and an end channel 48. The channels are preferably parallel to one another and preferably completely surround the tenon 40 in a connected manner. The distance between the base channel 42 and the first channel 44 is preferably greater than the distance between the first channel 44 and the second channel 44.

As shown in Figures 2 through 6 of the drawings, the board member 20 is comprised of an elongate structure having a first end 22 and a second end 24. The board member 20 may have various lengths, widths and heights as can be appreciated. The board member 20 may be comprised of wood, composite, plastic or other well-known materials. The first end 22 and the second end 24 are preferably angled for mating with a second end 24 and a first end 22 of additional board members 20 respectively. The angles of the first end 22 and the second end 24 may vary depending upon the type of structure desired to be constructed. The exemplary board member 20 illustrated in Figures 1 through 6 is merely for illustration purposes only and should not limit the structure of the board member 20 that the present invention may be utilized upon.

1 As shown in Figures 2, 4 and 9 of the drawings, a mortise **30** extends a finite
2 distance into the second end **24** of the board member **20**. The mortise **30** may have
3 various shapes, depths and sizes other than illustrated within the drawings as can be
4 appreciated. The mortise **30** preferably has a floor **32** and at least one inner wall **34**.
5 The inner wall **34** of the mortise **30** may be comprised of one or more walls. For
6 example, if a rectangular structure is used to construct the mortise **30**, then the mortise
7 **30** will have four inner walls **34**. In addition, the inner wall **34** of the mortise **30** may
8 include various shapes including but not limited to an oblong structure with rounded
9 end portions as shown in Figures 2 and 4 of the drawings. The mortise **30** may have a
10 circular, rectangular, square, elliptical, triangular, polygonal and other well-known
11 shapes not illustrated in the attached drawings.

12
13 The mortise **30** preferably has a depth sufficient to fully receive the entire
14 length of the tenon **40** as illustrated in Figures 7 and 8 of the drawings. The depth of
15 the mortise **30** is preferably slightly greater than the length of the tenon **40** for allowing
16 an amount of adhesive **12** to extend between the distal end of the tenon **40** and the
17 floor **32** of the mortise **30**.

18
19 As shown in Figures 1, 3, 4 and 5 of the drawings, the tenon **40** extends
20 transversely from the first end **22** of the board member **20** a finite distance. The tenon **40**
21 has at least one outer wall and a distal end. The tenon **40** has a shape and size that
22 corresponds to the shape and size of the mortise **30** to provide a firm fit. The tenon **40**
23 may have various shapes as stated for above for the mortise **30** including but not
24 limited to circular, rectangular, oblong, square, elliptical, triangular, polygonal and
25 other well-known shapes. The figures illustrate the usage of an oblong structure for
26 the tenon **40** with opposing rounded portions that corresponds to the shape of the
27 mortise **30**. The tenon **40** preferably has a length equal to or slightly shorter than the
28 depth of the mortise **30** to allow for the distribution of adhesive **12** around the distal

1 end of the tenon 40. As best shown in Figure 10 of the drawings, the width of the
2 tenon 40 is preferably less than the first end 22 thereby creating a T-structure.

3
4 The tenon 40 has a plurality of channels 42, 44, 46, 48 formed or cut within
5 utilizing conventional tools. The channels 42, 44, 46, 48 allow the adhesive 12 to
6 easily pass around the entire perimeter of the tenon 40 to ensure proper coverage of the
7 adhesive 12 regardless of the viscosity of the adhesive 12. The channels 42, 44, 46, 48
8 may have various shapes such as curved, syncline, square and various other well-
9 known shapes capable of allowing liquid adhesive 12 to pass through. The channels
10 42, 44, 46, 48 may have various depths other than that illustrated within the attached
11 figures. The number of channels may vary depending upon the board member 20, the
12 type of adhesive 12 used, the type of usage of the joint, and the size of the tenon 40.

13
14 As shown in Figures 1, 7, 8 and 10 of the drawings, the plurality of channels
15 42, 44, 46, 48 are preferably comprised of a base channel 42, a first channel 44, a
16 second channel 44 and an end channel 48. The base channel 42 extends into the outer
17 wall at the intersection of the tenon 40 and the first end 22 as best illustrated in Figure
18 10 of the drawings. The base channel 42 preferably is comprised of a slanted
19 structured angling toward the first end 22 as further shown in Figure 10 of the
20 drawings. It can be appreciated that various other shapes may be used for the base
21 channel 42 other than that illustrated in Figure 10 of the drawings.

22
23 The end channel 48 extends within the distal end of the tenon 40 as further
24 shown in Figures 1 and 10 of the drawings. The end channel 48 in effect creates a
25 tapered distal end for the tenon 40. A first channel 44 and a second channel 44 extend
26 into the outer sidewall of the tenon 40 between the end channel 48 and the base
27 channel 42. It can be appreciated that more or less channels may be utilized upon the
28 tenon 40 other than illustrated in the drawings.

1 As shown in Figures 1, 3 and 10 of the drawings, the channels are preferably
2 parallel to one another and preferably completely surround the tenon 40 in a connected
3 manner thereby allowing the adhesive 12 to completely surround the tenon 40. The
4 distance between the base channel 42 and the first channel 44 is preferably greater than
5 the distance between the first channel 44 and the second channel 44. The increased
6 distance between the base channel 42 and the first channel 44 provides increased
7 centering of the tenon 40 within the mortise 30 during installation.

8
9 The adhesive 12 utilized to secure the tenon 40 within the mortise 30 may be
10 comprised of any well-known adhesive 12 such as but not limited to wood glue or
11 polyurethane reactive (PUR). Many other types of adhesive 12 may be utilized within
12 the present invention to secure the tenon 40 within the mortise 30.

13
14 In use, the user may first apply the adhesive 12 within the mortise 30 and/or
15 upon the tenon 40. The user then inserts the tenon 40 within the mortise 30 with the
16 distal end of the tenon 40 entering the mortise 30 initially followed by the main body
17 of the tenon 40. As the tenon 40 is inserted into the mortise 30 in a snug manner, the
18 adhesive 12 is dispersed through the outer surface of the tenon 40 and the inner wall
19 34 of the mortise 30. Excess adhesive 12 flows through the channels 42, 44, 46, 48
20 within the tenon 40 into locations that require adhesive 12. After the tenon 40 is fully
21 and snugly seated within the mortise 30, the user then allows the adhesive 12 to dry
22 thereby bonding the tenon 40 within the mortise 30.

23
24 Alternatively, the user may hydraulically insert the adhesive 12 between the
25 inner wall 34 of the mortise 30 and the outer wall of the tenon 40 after the tenon 40 is
26 snugly positioned within the mortise 30. As shown in Figure 7 of the drawings, the
27 tenon 40 is fully positioned within the mortise 30. The user then hydraulically inserts
28 adhesive 12 between the inner wall 34 of the mortise 30 and the outer wall of the tenon
29 40. The adhesive 12 flows through the channels 42, 44, 46, 48 into all locations

1 between the tenon 40 and the mortise 30. The user continues inserting adhesive 12
2 until the joint is properly and thoroughly applied with adhesive 12.

3
4 As to a further discussion of the manner of usage and operation of the present
5 invention, the same should be apparent from the above description. Accordingly, no
6 further discussion relating to the manner of usage and operation will be provided.

7
8 With respect to the above description then, it is to be realized that the optimum
9 dimensional relationships for the parts of the invention, to include variations in size,
10 materials, shape, form, function and manner of operation, assembly and use, are
11 deemed to be within the expertise of those skilled in the art, and all equivalent
12 structural variations and relationships to those illustrated in the drawings and
13 described in the specification are intended to be encompassed by the present invention.

14
15 Therefore, the foregoing is considered as illustrative only of the principles of
16 the invention. Further, since numerous modifications and changes will readily occur to
17 those skilled in the art, it is not desired to limit the invention to the exact construction
18 and operation shown and described, and accordingly, all suitable modifications and
19 equivalents may be resorted to, falling within the scope of the invention.